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New Ammonoid Records from the Merchantville Formation (Upper Cretaceous) of Maryland and New Jersey

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ABSTRACT

A new collection from the Upper Cretaceous (Campanian) Merchantville Formation of Maryland with *Placenticeras placenta* (DeKay, 1828), *P. syrtale* (Morton, 1834), *Menabites* (*Delawarella*) *delawarensis* (Morton, 1830), *M.* (*D.*) *vanuxemi* (Morton, 1830), and *Scaphites* (*Scaphites*) *hippocrepis* (DeKay, 1828) III Cobban, 1969, agrees with species previously described from this unit. In contrast, another collection from Hedding, New Jersey, differs from previous collections. It contains *Menabites* (*Bererella*) *walnutensis* Young, 1963, *Glyptoxoceras aquisgranense* (Schlüter, 1872), and *Baculites vaalsensis* Kennedy and Jagt, 1995, in addition to *P. placenta* and *S.* (*S.*) *hippocrepis* III. This new assemblage from New Jersey shares elements in common with ammonoid faunas from central and Trans-Pecos Texas, and from the Vaals Formation in the Aachen region of Germany.

INTRODUCTION

The Merchantville Formation contains a diverse ammonoid fauna recently revised by Kennedy and Cobban (1993), who discussed previous work on the formation, and described *Pachydiscus* (*Pachydiscus*) sp., *Pseudoschloenbachia* cf. *P. chispaensis* Adkins, 1929, *Placenticeras placenta* (DeKay, 1828), *P. syrtale* (Morton, 1834), *Texanites* (*Tex-*

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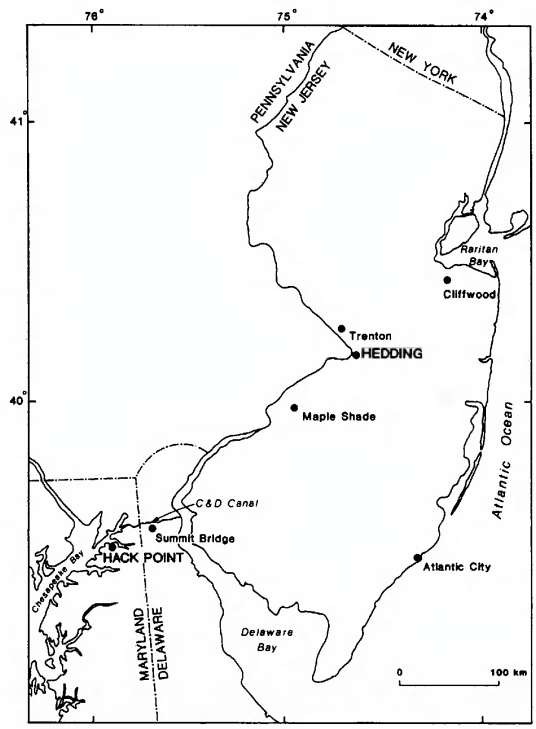

Fig. 1. Map of New Jersey and nearby areas in Delaware, Maryland, New York, and Pennsylvania showing localities mentioned in the text.

anites) sp., *Menabites* (*Delawarella*) *delawarensis* (Morton, 1830), *M.* (*D.*) *vanuxemi* (Morton, 1830), *Menabites* (*Bererella*) sp., *Submortoniceras punctatum* Collignon, 1948, *S. uddeni* Young, 1963, *Cryptotexanites paedomorphicus* Kennedy and Cobban, 1993, *Glyptoxoceras* sp., *Chesapeakella nodatum* Kennedy and Cobban, 1993, *Baculites haresi* Reeside, 1927, and *Scaphites* (*Scaphites*) *hippocrepis* (DeKay, 1828) III Cobban, 1969. *Submortoniceras uddeni* and *Pseudoschloenbachia* cf. *P. chispaensis* are known only from single specimens collected by L. W. Stephenson in 1932 along the Chesapeake and Delaware Canal (fig. 1). They indicate a correlation with the lowest Campanian zone of *Submortoniceras tequesquitense* of Texas (Young, 1963). The remainder of the fauna comes from the Merchantville Formation along the Chesapeake and Delaware Canal as well as the old Graham Brick Company pits at Maple Shade in Burlington County, New Jersey, and can be correlated with the broad *Menabites* (*Delawarella*) *delawarensis* zone of Texas (Young, 1963) and with the zone of *Scaphites* (*S.*) *hippocrepis* III of the Western Interior (Cobban, 1969).

The zone of *Scaphites* (*S.*) *hippocrepis* III has now been recognized at a new locality in Maryland: outcrops exposed at low tide on the south bank of the Bohemia River west of the bridge at Route 213 and east of the mouth of Scotchman Creek, Hack Point, Cecil County (fig. 1). The fauna consists of *Placenticeras placenta, P. syrtale, Menabites* (*Delawarella*) *delawarensis, M.* (*D.*) *vanuxemi,* and *S.* (*S.*) *hippocrepis* III. The last named species includes macroconchs as much as 61 mm in length, and microconchs that show much coarser ribbing along the venter than any known to us from the Western Interior.

Another new locality is along the tributary ravines of Spring Hill Creek, northwest of the Axe Factory—Hedding Road, 1.2 km northeast of Hedding, Burlington County, New Jersey (fig. 1). The fauna consists of *Placenticeras placenta, Menabites* (*Bererella*) *walnutensis* Young, 1963, *Glyptoxoceras aquisgranense* (Schlüter, 1872), *Baculites vaalsensis* Kennedy and Jagt, 1995, and *Scaphites* (*S.*) *hippocrepis* III. *Menabites* (*B.*) *walnutensis* was previously known only from the holotype, collected loose on Little Walnut Creek, Austin, Travis County, Texas (Young, 1963: 111). Young believed it to be from "formation D," some distance above the base of the *M.* (*B.*) *delawarensis* zone. We have also seen this species from the Big Bend region in Trans-Pecos Texas.

Given the probable horizon of *Menabites* (*B.*) *walnutensis* in Texas. we believe that the fauna at the Hedding locality is slightly younger than the previously known Merchantville faunas, although still within the zone of *Scaphites* (*S.*) *hippocrepis* III in the Western Interior. The absence of any species of *Menabites* (*Delawarella*) at the Hedding locality is striking, because *M.* (*D.*) *delawarensis* and *M.* (*D.*) *danei* extend well above the upper limit of *S.* (*S.*) *hippocrepis* III in Texas.

This new assemblage provides a direct link with the as yet poorly known Campanian ammonoid sequences of Western Europe, where relatively long-ranging *Scaphites* (*S.*) *hippocrepis* III and *Glyptoxoceras aquisgra-*

Fig. 2. *Placenticeras placenta* (DeKay, 1828), USNM 487960, Merchantville Formation, Hedding, New Jersey. Figures are ×0.9.

nense occur with *Baculites vaalsensis* in a narrow interval in the Vaals Formation near Aachen, Germany, and adjacent parts of The Netherlands and Belgium (Kennedy and Jagt, 1995).

Conventions

The following abbreviations are used to indicate the repositories of specimens mentioned in the text: ANSP—Academy of Natural Sciences, Philadelphia; GPIB—Geologisches und Paläontologisches Institut, Bonn University; IRSNB—Institut Royal des Sciences Naturelles de Belgique, Brussels; MAPS—Monmouth Amateur Paleontologists Society, West Long Branch, New Jersey; USNM—U.S. National Museum of Natural History, Washington, D.C.; TMM-UT—Texas Memorial Museum, Austin, Texas. Casts of some specimens are deposited in the U.S. Geological Survey collections in Denver, Colorado.

Suture terminology is that of Wedekind (1916), as reviewed by Kullmann and Wiedmann (1970), with E = external lobe, L = lateral lobe, U = umbilical lobe, and I = internal lobe. The term "rib index" as applied to heteromorphs is the number of ribs in a distance equal to the whorl height at the mid-point of the interval counted. All dimen-

sions are expressed in millimeters, with D = diameter, Wb = whorl breadth, Wh = whorl height, and U = umbilical diameter. Figures in parentheses are dimensions as a percentage of diameter. Specimens are photographed in the customary position with the aperture on top although the authors recognize that the animals would have been oriented differently in life.

SYSTEMATIC PALEONTOLOGY

ORDER AMMONOIDEA ZITTEL, 1884

SUBORDER AMMONITINA HYATT, 1889

SUPERFAMILY HOPLITACEAE DOUVILLÉ, 1890

FAMILY PLACENTICERATIDAE HYATT, 1900

Genus *Placenticeras* Meek, 1876

TYPE SPECIES: *Ammonites placenta* DeKay, 1828: 278, by original designation of Meek, 1876: 426.

Placenticeras placenta (DeKay, 1828)
Figure 2

Ammonites placenta DeKay, 1828: 278, pl. 5, fig. 2 (not 5).
Placenticeras placenta (DeKay, 1828), Cobban and Kennedy, 1992: 443, figs. 3.1, 3.5, 7.4.
Placenticeras placenta (DeKay, 1828), Kennedy and Cobban, 1993: 834, figs. 5.7, 5.8, 6.1, 6.2, 9.14–9.16 (with full synonymy).
Placenticeras placenta (DeKay, 1828), Kennedy and Cobban, 1994a: 98, figs. 4.1–4.5, 4.17, 4.18, 4.21, 5.2.
?*Placenticeras* cf. *P. placenta* (DeKay, 1828), Kennedy and Cobban, 1994b: 1288, figs. 4.4, 4.5.

TYPE: DeKay's specimen is lost. It was from the Merchantville Formation on the Chesapeake and Delaware Canal. We hereby designate a neotype, ANSP 19490, believed to be the original of Morton (1834: pl. 2, figs. 1, 2), refigured by Whitfield (1892: pl. 40, fig. 1), Reeside (1962: pl. 72, figs. 6, 7), and Kennedy and Cobban (1993: fig. 6). The specimen is from an unknown horizon and locality, but is believed to be from the Merchantville Formation (fide Kennedy and Cobban, 1993).

MATERIAL: Eight specimens in the MAPS and USNM collections.

DISCUSSION: *Placenticeras placenta* is rare in the Hedding fauna. Part of a large specimen (USNM 487960, fig. 2) has the following dimensions: D = 139 (100); Wb = 40.8 (29.4); Wh = 72.5 (52.2); Wb:Wh = 0.56; and U = 22.0 (15.8).

OCCURRENCE: Fairly abundant at many localities in the Merchantville Formation in Maryland, Delaware, and New Jersey; also recorded from the underlying Magothy Formation, as well as the Woodbury, Marshalltown, and Wenonah formations, and possibly the Mount Laurel Sand, in New Jersey; also Upper Campanian of North Carolina, Arkansas, and northeastern Texas.

SUPERFAMILY ACANTHOCERATACEAE DE GROSSOUVRE, 1894

FAMILY COLLIGNONICERATIDAE WRIGHT AND WRIGHT, 1951

SUBFAMILY TEXANITINAE COLLIGNON, 1948

Genus *Menabites* Collignon, 1948

TYPE SPECIES: *Menabites menabensis* Collignon, 1948: 7(64), pl. 17, figs. 3, 4; pl. 18, fig. 1, by subsequent designation of Wright, 1957: L432.

Subgenus *Bererella* Collignon, 1948

TYPE SPECIES: *Menabites* (*Bererella*) *bererensis* Collignon, 1948: 22(79), pl. 25, fig. 1, by original designation of Collignon, 1948: 7(64).

Menabites (*Bererella*) *walnutensis* Young, 1963
Figures 3–7

Menabites s.l., *walnutensis* Young, 1963: 109, pl. 58, figs. 1, 4; text-figs. 20e, f, 26k.
Submortoniceras chicoense (Trask, 1856), Young, 1963: 106, pl. 57, figs. 1–3; text-figs. 11e, f, 12d.
?*Menabites* (*Bererella*) sp., Kennedy and Cobban, 1993: 841, figs. 14.36, 14.38, 14.39.

TYPE: Holotype, by monotypy, is TMM-UT-18, from formation D of the Austin Chalk, "Little Walnut Creek, and the old Manor Road," Travis County, Texas.

MATERIAL: Twenty-six specimens in the USNM and MAPS collections.

DESCRIPTION: Robust individuals show relatively evolute coiling and well-developed tuberculation on sparse, distant ribs (figs. 3, 4). The smallest individual in our collection is 23 mm in diameter (fig. 3D, E; table 1). The intercostal whorl section is compressed and trapezoidal; the costal whorl section is compressed and polygonal with the greatest breadth at the submarginal tubercles. Fifteen or sixteen coarse bullae occur on the umbilical shoulder, and give rise to low, broad, straight prorsiradiate ribs that terminate in much stronger, conical submarginal tubercles. Poorly defined, broad ribs link these tubercles to weaker external clavi, which are separated by a groove from a coarse, feebly undulose, entire siphonal keel. This trituberculate stage is succeeded by a quadrituberculate stage with the appearance of another row of very weak, clavate lateral tubercles, which develops at a range of shell diameters starting from as little as 16 mm.

In middle ontogeny, there is variation in the relative strength of ribs and tubercles, with the density of primary ribs ranging from 7 to 9 per half whorl on the phragmocone. Some shells remain quadrituberculate, with the lateral and submarginal tubercles always weaker than those of the umbilical and external rows; in other specimens, another row of very weak, elongate submarginal tubercles develops.

Body chambers are 240–270° in angular length and show progressive weakening of the lateral and submarginal tubercles. Some body chambers are quadrituberculate throughout, but others develop a feeble, fifth submarginal row. The largest robust individual in our collection is 105 mm in diameter.

Gracile individuals are much more compressed (whorl breadth to whorl height ratios as low as 0.56) and are generally more involute than robust individuals (figs. 5, 6; table 1). The smallest individual in our collection is 17 mm in diameter, and is initially smooth except for an entire siphonal keel flanked by shallow grooves. Small umbilical bullae appear, followed by delicate external clavi, which are at least twice as numerous as the umbilical bullae. As size increases, delicate prorsiradiate ribs develop, arising from the bullae, and weakening at mid-flank, and increasing by branching and intercalation. These ribs strengthen on the outer flank and sweep forward to link up with the external clavi. Tiny submarginal tubercles appear at a diameter of approximately 40 mm and are followed by tiny lateral tubercles. At a diameter of approximately 75 mm, specimens show as many as 18 umbilical and 36 external tubercles per whorl.

The largest gracile adult in our collection is 161 mm in diameter, including the body chamber. Specimens range from 55 to 92 mm in diameter at the base of the body chamber. Delicate ribs are accompanied by coarse striae and lirae. Umbilical bullae persist to the adult aperture; the lateral and submarginal rows are minute and either or both may efface, while occasional specimens develop very elongate, delicate submarginal clavi on the adoral part of the phragmocone and body chamber. The suture shows long digitate elements on a broad, bifid E/L; L is broad (fig. 7).

DISCUSSION: Our collection includes phragmocones that grade from robust to gracile and from quadri- to pentatuberculate, although the fifth, submarginal row is always very weak; we regard pentatuberculate specimens as end members of a variable population. Adult size varies markedly and there is an apparent size dimorphism. Macroconchs are represented by gracile forms, microconchs by robust forms. The two largest gracile specimens in our collection are 147 and 161 mm in diameter; the two largest robust specimens are 98 and 105.5 mm in diameter.

Menabites (*Bererella*) *walnutensis* differs from all other species of *Menabites* (*Bererella*) in the persistence of a quadrituberculate stage to maturity, and, in some specimens, the development of a very weak, fifth, submarginal row of tubercles. The wide intraspecific variation recognized in this species implies that typical *M.* (*B.*) *walnutensis* individuals grade into those with greatly reduced ribbing and tuberculation, which are homeomorphous with *Submortoniceras*. Indeed, Young (1963: 106, pl. 57, figs. 1–3; text-figs. 11e, f, 12d) referred what we regard as a variant of *M.* (*B.*) *walnutensis* to *Submortoniceras chicoense* (Trask, 1856).

Klinger and Kennedy (1980) argued that the type species of *Submortoniceras* Spath,

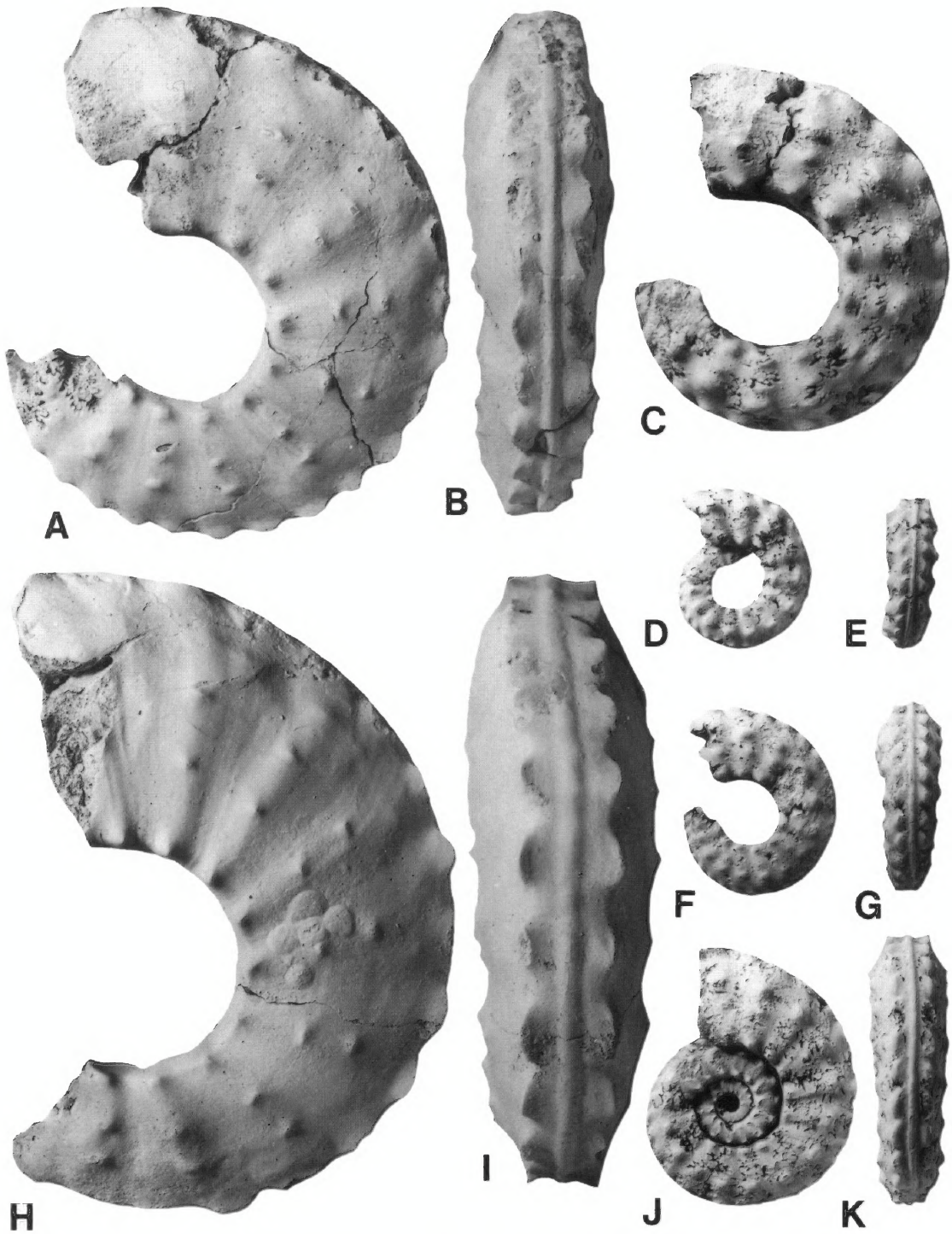

Fig. 3. *Menabites* (*Bererella*) *walnutensis* Young, 1963, Merchantville Formation, Hedding, New Jersey. **A, B.** USNM 487967; **C.** USNM 487963; **D, E.** USNM 487961; **F, G.** USNM 487962; **H, I.** MAPS A2054a1; **J, K.** MAPS A2054a5. All figures are ×1.

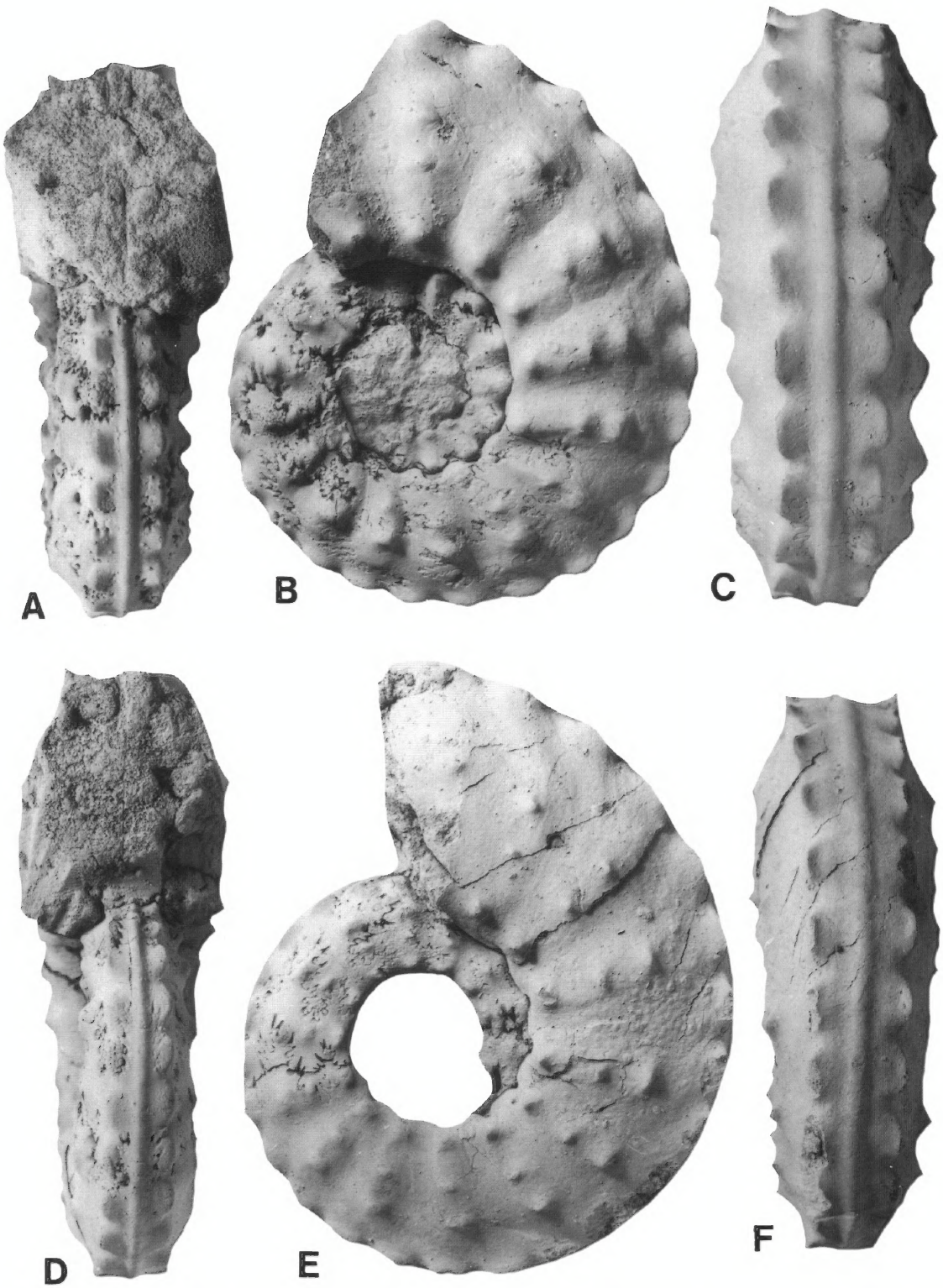

Fig. 4. *Menabites (Bererella) walnutensis* Young, 1963, Merchantville Formation, Hedding, New Jersey. **A–C.** USNM 487964; **D–F.** MAPS A2054a2. All figures are ×1.

TABLE 1
Dimensions (mm) of *Menabites* (*Bererella*) *walnutensis* Young, 1963[a]

	D	Wb	Wh	Wb:Wh	U
Robust Specimens					
USNM 487961 c	23.0(100)	8.5(37.0)	9.1(39.6)	0.93	5.5(23.9)
USNM 487962 c	29.1(100)	10.5(36.1)	11.7(40.2)	0.90	9.1(13.3)
MAPS A2054a5 c	38.9(100)	11.6(29.8)	15.5(39.8)	0.75	14.8(38.0)
USNM 452710 c	50.3(100)	18.5(36.7)	17.9(35.6)	1.03	20.8(41.4)
USNM 487963 c	53.4(100)	15.3(28.7)	20.3(38.0)	0.75	20.2(37.8)
USNM 452711 c	72.5(100)	24.4(33.7)	28.2(38.9)	0.86	27.5(37.9)
USNM 487964[b] c	83.0(100)	32.0(38.5)	33.2(40.0)	0.96	31.7(38.1)
MAPS A2054a2 c	98.0(100)	33.6(34.2)	41.0(41.8)	0.81	31.1(31.7)
MAPS A2054a1 c	105.5(100)	33.5(31.8)	43.4(41.1)	0.77	34.6(32.8)
Gracile Specimens					
USNM 487965 ic	17.0(100)	4.9(28.8)	7.4(43.5)	0.66	5.5(32.4)
USNM 487966 ic	25.2(100)	7.0(27.7)	12.2(48.4)	0.57	—(—)
USNM 452712 c	70.0(100)	19.9(28.4)	29.3(41.9)	0.68	21.0(30.0)
MAPS A2054a3 c	73.0(100)	21.1(28.9)	38.0(52.0)	0.56	15.5(21.2)
MAPS A2054a4 c	147.0(100)	41.8(28.4)	57.0(38.8)	0.73	46.5(31.6)
USNM 452713 c	161.0(100)	40.0(24.8)	63.5(39.4)	0.63	50.2(31.2)

[a] Figures in parentheses are percentages of diameter; D = diameter; Wb = whorl breadth; Wh = whorl height; U = umbilical diameter; c = measured in costal whorl section; ic = measured in intercostal whorl section.
[b] Measured at a point slightly adapical of the aperture.

1921 (*S. woodsi* Spath, 1921: 232, pl. 21, fig. 1) arose from *Texanites soutoni* (Baily, 1855); recognition of convergent derivatives from *Menabites* may indicate that some of the species currently referred to *Submortoniceras* (see list in Klinger and Kennedy, 1980: 231) might be derived from genera other than *Texanites*.

OCCURRENCE: Merchantville Formation, Hedding, New Jersey; Austin Chalk, near Austin, Travis County, Texas; Brewster County, Trans-Pecos Texas.

SUBORDER ANCYLOCERATINA WIEDMANN, 1966

SUPERFAMILY TURRILITACEAE GILL, 1871

FAMILY DIPLOMOCERATIDAE SPATH, 1926

SUBFAMILY DIPLOMOCERATINAE SPATH, 1926

Genus *Glyptoxoceras* Spath, 1925

TYPE SPECIES: *Hamites rugatus* Forbes, 1846: 117, pl. 11, fig. 2, by original designation of Spath, 1925: 30, as *Hamites* (*Anisoceras*) *rugatus* (Forbes) Kossmat.

Glyptoxoceras aquisgranense (Schlüter, 1872)

Figure 8

Toxoceras (?) *aquisgranense* Schlüter, 1872: 102, pl. 31, figs. 6–9.
Glyptoxoceras aquisgranense (Schlüter, 1872), Kennedy *in* Kennedy et al., 1992: 274, pl. 1, figs. 6, 7, 11, 12, 14–19; pl. 2, figs. 1–5, 9–15; pl. 3, figs. 1–9.
Glyptoxoceras aquisgranense (Schlüter, 1872), Kennedy and Jagt, 1995: 278, figs. 2.1–2.3, 3.2–3.6, 3.9, 3.10 (with synonymy).
Glyptoxoceras aquisgranense (Schlüter, 1872), Kennedy et al., 1995: pl. 1, fig. 15.

TYPE: Lectotype, by subsequent designation of Kennedy et al. (1992: 274) is an unregistered specimen in the GPIB collections, the original of Schlüter (1872: 102, pl. 31, figs. 6–9) from the lower Campanian Vaals Formation at the foot of the Lusberges near Aachen, Germany, reillustrated by Kennedy and Jagt (1995: figs. 2.1–2.3).

MATERIAL: Twenty-three fragments in the USNM and MAPS collections.

DESCRIPTION: Curved phragmocone and body chamber fragments show whorl heights of 5–17 mm, and lengths of up to 95 mm. The whorl section is compressed and oval.

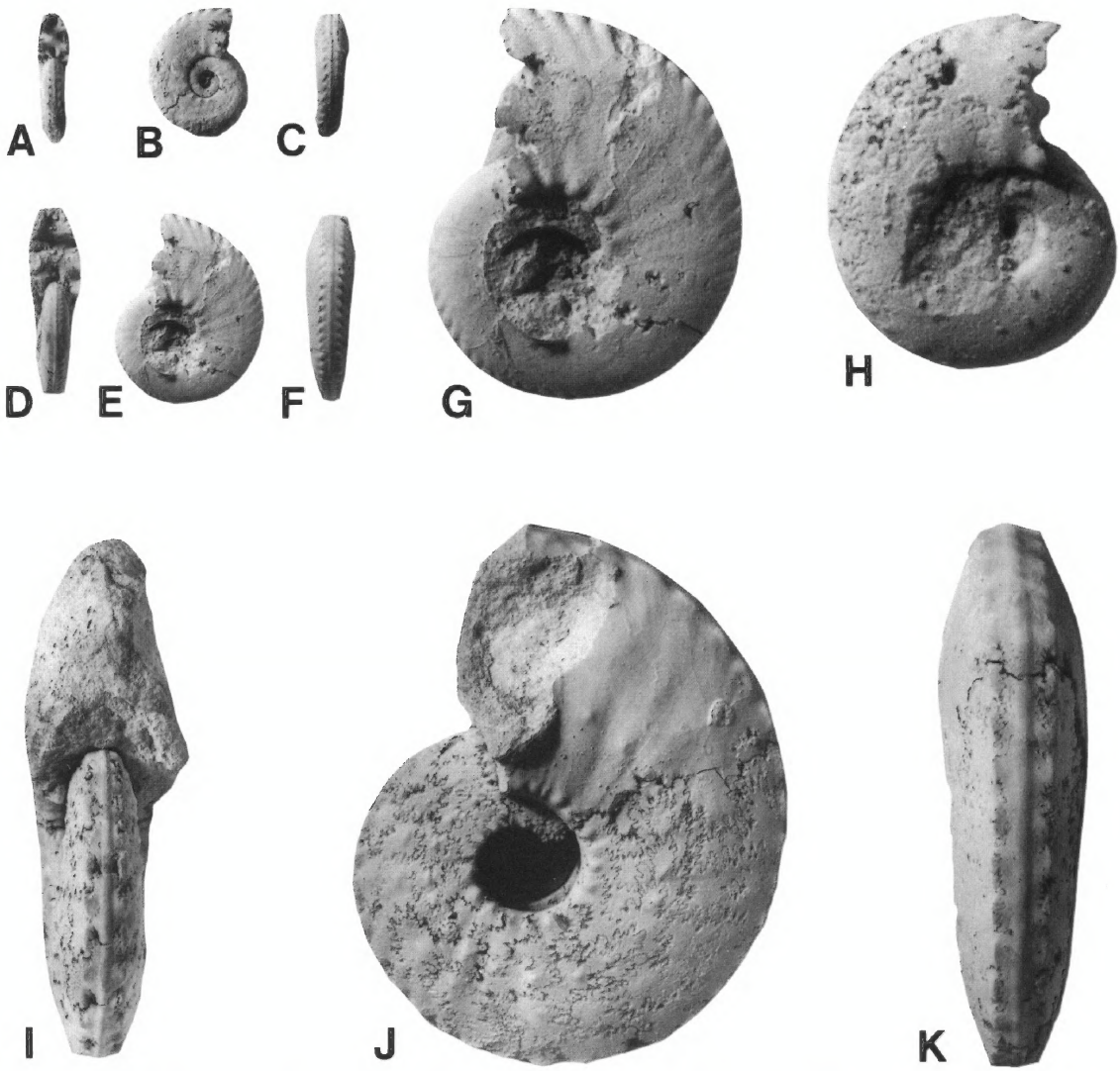

Fig. 5. *Menabites* (*Bererella*) *walnutensis* Young, 1963, Merchantville Formation, Hedding, New Jersey. **A–C.** USNM 487965; **D–G.** USNM 487966; **H.** USNM 433783; **I–K.** MAPS A2054a3. Figures A–F, I–K are ×1; fig. G is ×2; fig. H is ×4.

The rib index is 4–8. Ribs are weak and transverse on the dorsum but strengthen on the flanks where they are straight to feebly convex and weakly prorsiradiate. Ribs are transverse across the venter where they reach maximum strength. One fragment, possibly the apertural margin of an adult, shows a marked constriction followed by a flared collar rib (fig. 8H–J).

DISCUSSION: Kennedy, *in* Kennedy et al. (1992), provided a detailed account of the complex ontogeny and variation in this species, based on a somewhat younger assemblage from Nalzen in Ariège, France, and Kennedy and Jagt (1995) reillustrated the type material. *Glyptoxoceras roemeri* (Geinitz, 1849: 118) has very coarse, annular prorsiradiate ribs, with a rib index of 3–4. *Glyptoxoceras vaalsiensis* (Holzapfel, 1887: 66, pl. 5, figs. 6, 7) has prorsiradiate ribs, periodic flares and constrictions on the body chamber, and a greatly simplified suture.

OCCURRENCE: Lower Campanian of north-

Fig. 6. *Menabites (Berervella) walnutensis* Young, 1963, MAPS A2054a4, Merchantville Formation, Hedding, New Jersey. Figures are ×1.

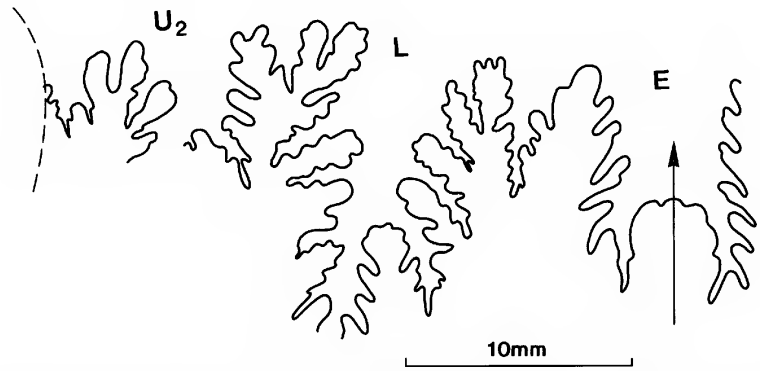

Fig. 7. External suture of *Menabites (Bererella) walnutensis* Young, 1963, USNM 452715, Merchantville Formation, Hedding, New Jersey.

eastern Belgium and adjacent parts of The Netherlands and Germany, and Hedding, New Jersey. The occurrence at Nalzen, Ariège, France may be as high as lower upper Campanian.

FAMILY BACULITIDAE GILL, 1871

Genus *Baculites* Lamarck, 1799

TYPE SPECIES: *Baculites vertebralis* Lamarck, 1801: 103, by the subsequent designation of Meek, 1876: 391.

Baculites vaalsensis Kennedy and Jagt, 1995
Figures 9, 10

Baculites incurvatus Dujardin, Holzapfel, 1887: 64 (*pars*), pl. 4, figs. 5, 6; pl. 5, fig. 10.
Baculites incurvatus Dujardin, Müller and Wollemann, 1906: 4, pl. 2, figs. 2–5.
Baculites bohemicus Fritsch, van der Weijden, 1943: 122, pl. 12, figs. 17, 18; pl. 13, fig. 5.
Baculites vaalsensis Kennedy and Jagt, 1995: 282, figs. 4.1–4.18, 5.1–5.17, 6.1–6.9.

TYPES: The holotype is the original of van der Weijden (1943: pl. 13, fig. 5) from the Hervian of Emma Colliery, Shaft 1, near Treebeek, The Netherlands. There are four paratypes.

MATERIAL: Seventeen fragments in the USNM and MAPS collections.

DESCRIPTION: Specimens are internal molds including phragmocones with whorl heights of as much as 35 mm, and body chamber fragments with whorl heights of as much as 32 mm. The shell expands slowly. The whorl section is compressed and ovoid with a broadly rounded dorsum, feebly convex inner and convergent outer flanks, and a narrowly rounded venter. The whorl breadth-to-height ratio is 0.69–0.74. Of the 17 fragments, 11 lack nodes, one is incipiently nodate, and five have strong dorsolateral nodes. Nodeless variants show a highly characteristic ornament of very coarse, even lirae (fig. 9D–I). These lirae are convex and weakest on the dorsum; they sweep backward and strengthen on the dorsolateral flanks and sweep forward on the ventrolateral flanks. The lirae strengthen further and cross the venter in a narrow, linguoid peak. Some nodate variants show the same coarse, even lirae, but also develop coarse, conical to feebly crescentic dorsolateral nodes, separated by intervals equal to one or two times the whorl height (fig. 9A–C); other nodate specimens show more subdued lirae (fig. 9J–L). The suture is moderately incised, with broad, bifid E/L and L/U, narrow L, and small U (fig. 10).

DISCUSSION: The distinctive coarse lirae occur on both noded and nodeless specimens in the Hedding assemblage, suggesting that these specimens are no more than intraspecific variants of a single species. Kennedy and Jagt (1995) discussed differences from other European and Indo-Malagasy species. Of American forms, the closest similarities are with *Baculites haresi* Reeside, 1927 (p. 10, pl. 6, figs. 5–10; pl. 7, figs. 9, 10; with synonymy), which also occurs in the Merchantville Formation (Kennedy and Cobban, 1993: 844, figs. 14.18–14.35, 14.37, 15.2,

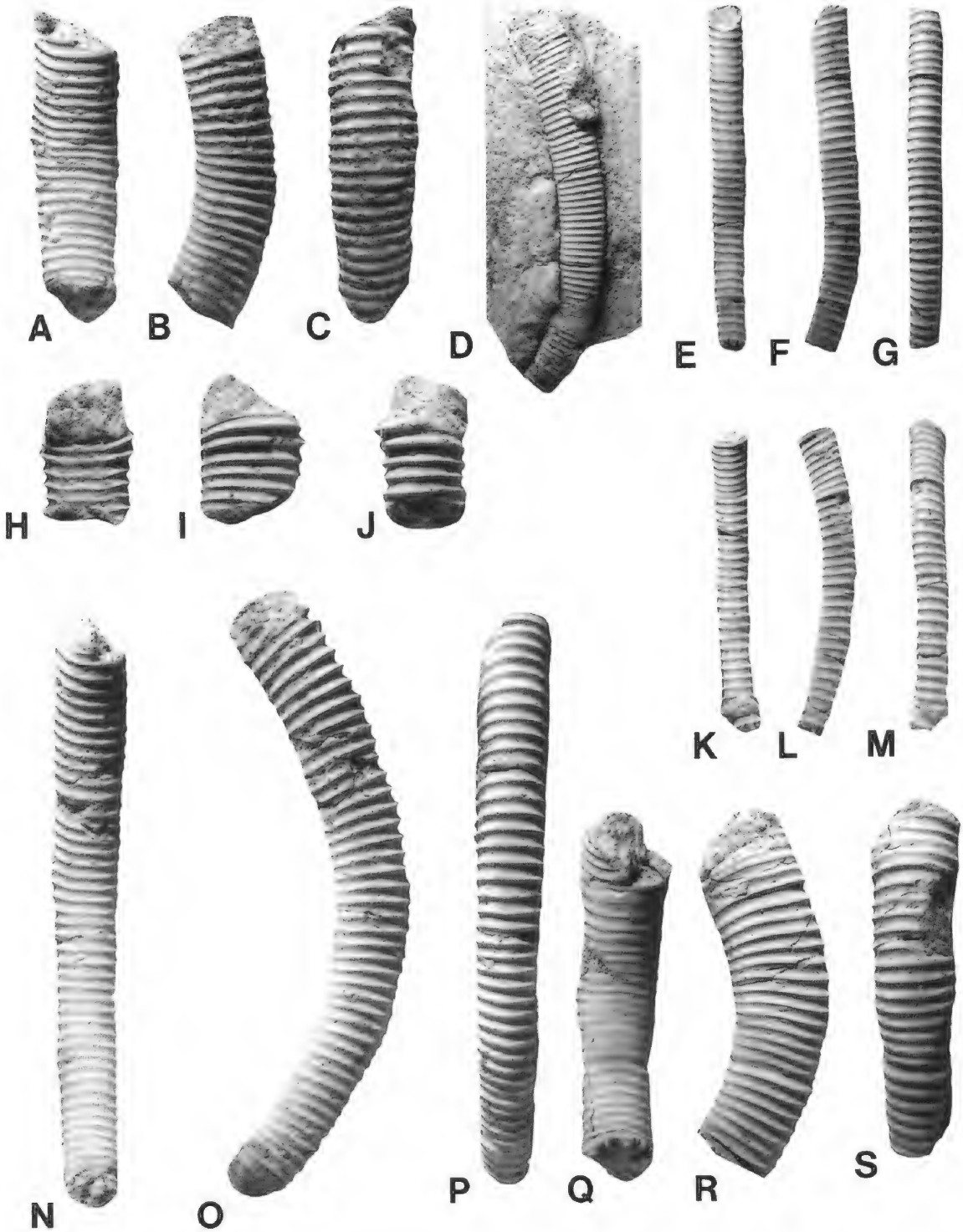

Fig. 8. *Glyptoxoceras aquisgranense* (Schlüter, 1872), Merchantville Formation, Hedding, New Jersey. **A–C.** USNM 487968; **D.** MAPS A2055a1; **E–G.** MAPS 2055a3; **H–J.** USNM 487970; **K–M.** USNM 487969; **N–P.** MAPS A2055a2; **Q–S.** USNM 487971. All figures are ×1.

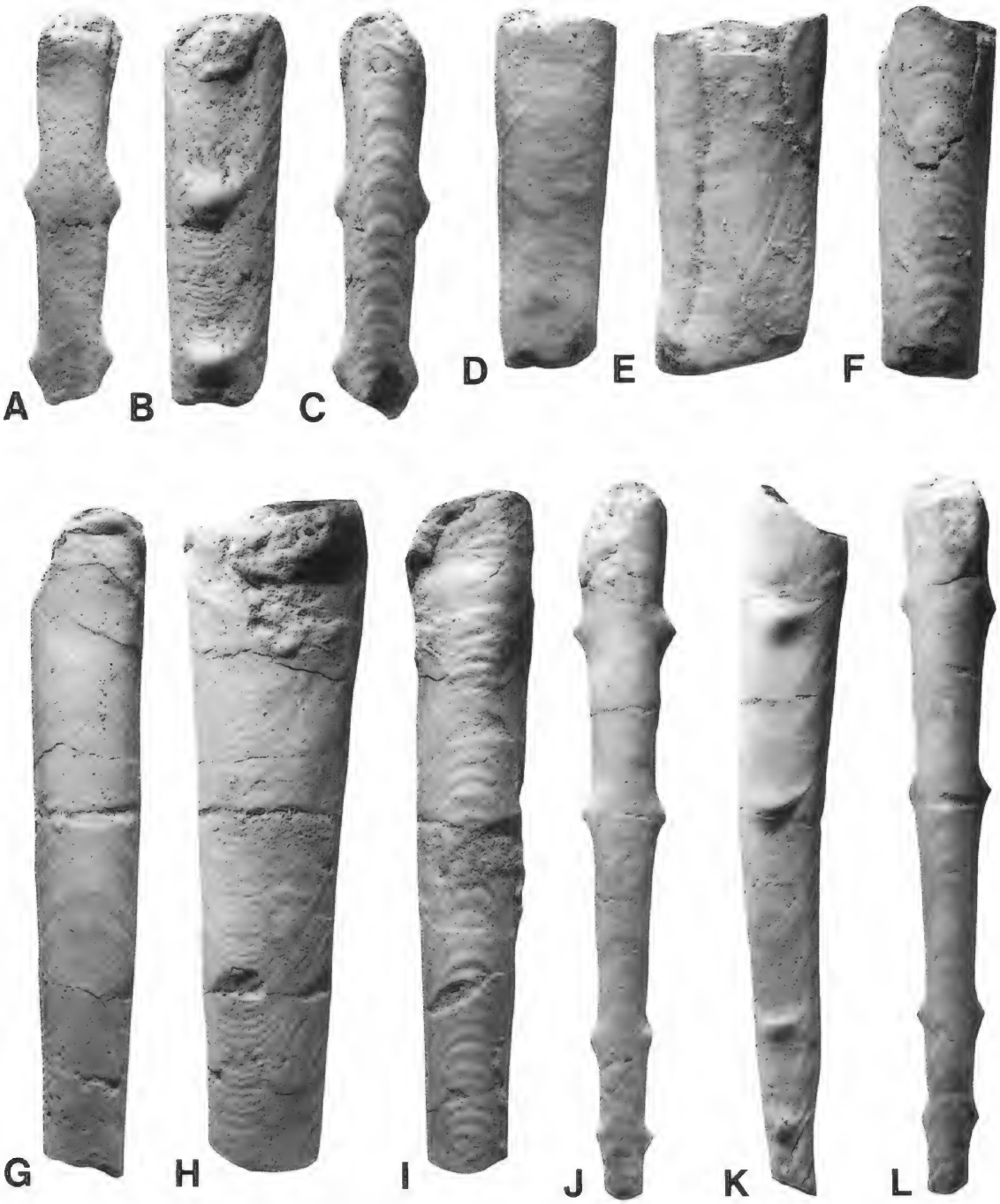

Fig. 9. *Baculites vaalsensis* Kennedy and Jagt, 1995, Merchantville Formation, Hedding, New Jersey. **A–C.** USNM 487972; **D–F.** USNM 487973; **G–I.** MAPS A2056a1; **J–L.** MAPS A2056a2. All figures are ×1.

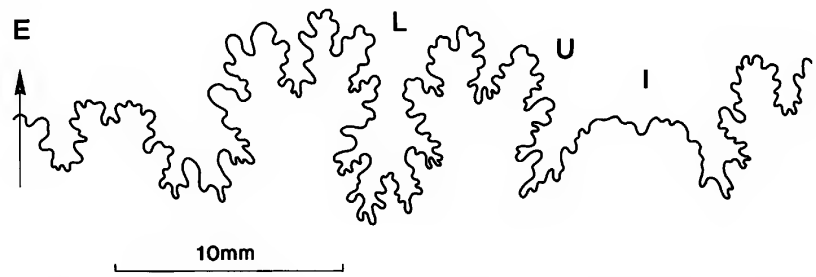

Fig. 10. Suture of *Baculites vaalsensis* Kennedy and Jagt, 1995, USNM 487972, Merchantville Formation, Hedding, New Jersey.

16.1–16.6), but *B. haresi* shows delicate, irregular growth lines on the flanks, which coarsen over the venter. *B. haresi* may also develop crescentic, dorsolateral ribs but never the nodes and coarse lirae of *B. vaalsensis.*

OCCURRENCE: Lower Campanian of northeastern Belgium and adjacent parts of The Netherlands and Germany, northern Aquitaine (France), and Hedding, New Jersey.

SUPERFAMILY SCAPHITACEAE GILL, 1871

FAMILY SCAPHITIDAE GILL, 1871

SUBFAMILY SCAPHITINAE GILL, 1871

Genus and subgenus *Scaphites* Parkinson, 1811

TYPE SPECIES: *Scaphites equalis* J. Sowerby, 1813: 53, pl. 18, figs. 1–3, by subsequent designation of Meek, 1876: 413.

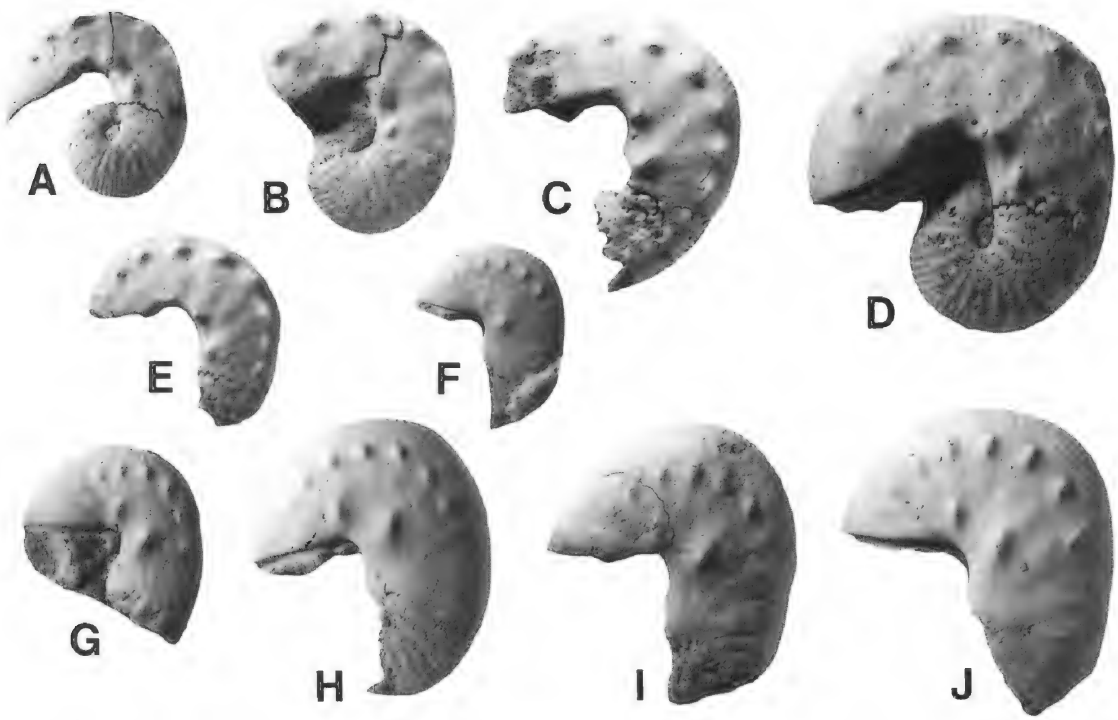

Fig. 11. *Scaphites* (*Scaphites*) *hippocrepis* (DeKay, 1828) III Cobban, 1969, Merchantville Formation, Hedding, New Jersey. A–E. Microconchs: **A.** USNM 487974; **B.** USNM 487976; **C.** USNM 487977; **D.** USNM 452714; **E.** USNM 487975. F–J. Macroconchs: **F.** USNM 487978; **G.** USNM 487979; **H.** MAPS A2008i1; **I.** USNM 487980; **J.** USNM 487981. All figures are ×1.

Scaphites (Scaphites) hippocrepis (DeKay, 1828) III Cobban, 1969
Figure 11

Ammonites hippocrepis DeKay, 1828: 273, pl. 5, fig. 5.
Scaphites hippocrepis (DeKay, 1828) III Cobban, 1969: 21, pl. 3, figs. 1–25; pl. 4, figs. 35–49; pl. 5, figs. 36–40; text-figs. 2, 4, 10, 11.
Scaphites hippocrepis (DeKay, 1828), Schmid and Ernst, 1975: 322, pl. 1, figs. 1, 2; text-fig. 1.
Scaphites hippocrepis (DeKay, 1828), Kennedy and Jagt, 1995: 288, figs. 7.1–7.23, 8.1–8.5.
Scaphites hippocrepis (DeKay, 1828), Kennedy et al., 1995: pl. 1, figs. 3–7.

TYPE: Neotype, designated by Kennedy (1986: 118), is the holotype of *Scaphites cuvieri* Morton, 1834, ANSP 19483, from the Deep Cut of the Chesapeake and Delaware Canal, Delaware.

MATERIAL: Thirty-one specimens with body chambers preserved, plus four phragmocone fragments in the USNM and MAPS collections.

DISCUSSION: This is by far the largest collection of this subspecies from a single horizon on the Atlantic Seaboard. Of those specimens retaining part or all of the body chamber, 17 are macroconchs with body chambers from 17 to over 40 mm in length and 14 are microconchs with body chambers from 11.5 to 25.5 mm in length. The degree of size overlap of dimorphs is striking (fig. 11), but typical of that noted by Cobban (1969).

OCCURRENCE: Widespread in the lower Campanian in the Western Interior, Texas, Alabama, New Jersey, Maryland, and Delaware. Passage forms to *Scaphites (S.) hippocrepis* (DeKay, 1828) II Cobban, 1969, occur in northeastern Belgium and adjacent parts of Germany and The Netherlands, Aquitaine and Provence (France), Hampshire and Sussex (England), and Israel.

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